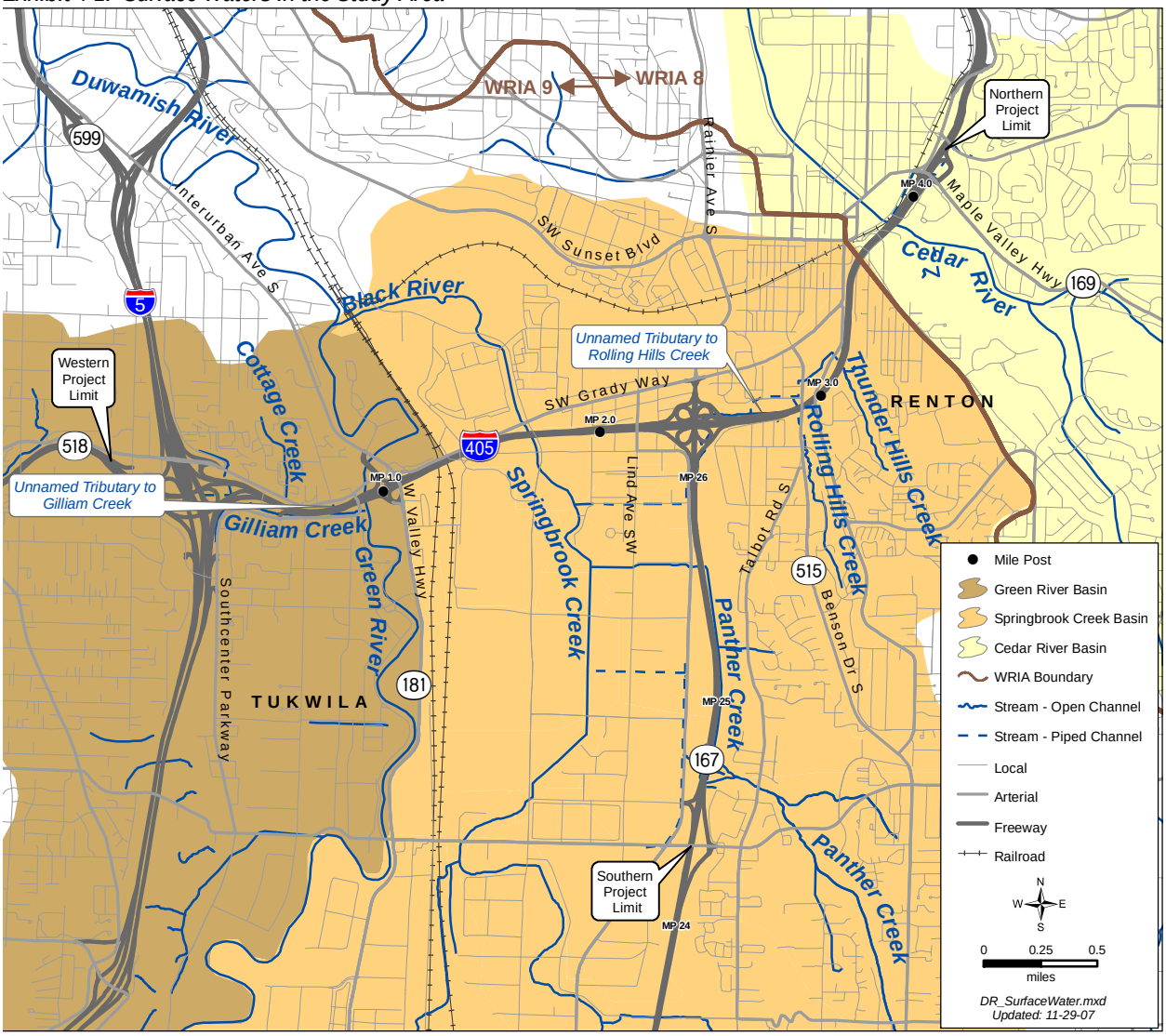
SECTION 4 BASELINE CONDITIONS

What surface waterbodies exist in the study area?

Exhibit 4-1 shows that the study area primarily includes surface waterbodies in the Green River watershed (WRIA 9). The study area also includes surface waterbodies in the Cedar River watershed (WRIA 8). Surface waterbodies in the study area include Cottage Creek, Gilliam Creek, an unnamed tributary to Gilliam Creek, the Green River, Springbrook Creek, Panther Creek, Rolling Hills Creek, unnamed tributary to Rolling Hills Creek, Thunder Hills Creek, unnamed tributary to Thunder Hills Creek, and the Cedar River.

Exhibit 4-1: Surface Waters in the Study Area



In general, the surface waterbodies in the Tukwila to Renton Project study area have been highly altered from their natural states to accommodate residential, commercial, and industrial land uses. This alteration has included bank hardening, such as installing riprap and placing streams in concrete channels and pipes; reducing or removing streamside vegetation; straightening stream channels; and removing in-stream habitat. The installation of levees has also reduced the historic floodplains associated with many of these waterbodies. Dramatic changes have also occurred in the vegetation surrounding these waterbodies. What was once predominantly mature native vegetation has been replaced by a mix of immature native vegetation and non-native invasive plant species.

The following sections describe these surface waters starting at the I-405/I-5 interchange and moving northbound. For details on the ecosystems associated with these waterbodies please see the *Ecosystems Discipline Report*.[6]

Cottage Creek

Cottage Creek is a tributary to Gilliam Creek that originates from the City Hall drainage basin located north of I-405 at approximately milepost 0.4 in the city of Tukwila. The creek has a basin size of approximately 0.1 square miles. It flows south from the hillside and passes under Southcenter Boulevard via a culvert. The creek flows as an open channel for approximately 12 linear feet immediately north of I-405 then flows under I-405 via another culvert and joins with Gilliam Creek at a stormwater outfall.

This flap gate prevents high flows in the Green River from entering Gilliam Creek

Gilliam Creek

Gilliam Creek flows along the south side of I-405 to the Green River in a series of open channels and large culverts. It has a basin size of approximately 1.21 square miles. Gilliam Creek enters the Green River via a 108-inch-diameter flap gate. The flap gate prevents high flows in the Green River from entering the creek. Surface water runoff in its drainage area is conveyed through a network of underground pipes, drainage ditches, and open stream channels.

[6] *WSDOT 2007*

Unnamed Tributary to Gilliam Creek

An unnamed tributary flows into Gilliam Creek via a culvert immediately west of Gilliam Creek's confluence with the Green River. This tributary has no open channel except for an approximately 50-foot section that daylights into, and flows through, a small riparian wetland immediately north of I-405. The unnamed tributary has a basin size of 0.07 square miles.

Green River

The Green River drainage basin covers approximately 492 square miles. The Green River crosses I-405 at milepost 0.8. The river has an average flow of 1,696 cubic feet per second (cfs) based on flow records spanning the past 67 years as measured near Auburn.[7] The Howard Hanson Dam, located northeast of Enumclaw at river mile 64.5, regulates the flow of the Green River. This dam maintains the river's flow at a 2-year, 24-hour peak flow rate.

Green River at I-405 milepost 0.8

The Green River Valley is the historic floodplain of the Green River. The valley is relatively flat, and it has become highly urbanized with commercial and industrial development. The *Land Use Discipline Report*[8] provides more information on land use in this area.

Springbrook Creek

The Springbrook Creek basin covers approximately 24 square miles. Springbrook Creek is the main tributary to the Green River in the study area, and it crosses under the I-405 bridge at milepost 1.6.

Approximately one mile north of I-405, the Black River Pump Station was built at the confluence of Springbrook Creek and the Black River. Flows from Springbrook Creek into the Green River are controlled by this pump station. The creek has an average annual flow of 10.2 cfs based on flow records spanning the past 12 years as measured upstream of the study area at Orillia.[9]

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[7] *WSDOT 2005a*

[8] *WSDOT 2007*

[9] *USGS 2005*

Panther Creek and Wetlands

The Panther Creek basin encompasses approximately 4.2 square miles. Panther Creek originates from Panther Lake on hills east of SR 167 and flows northwest from the lake to where it encounters SR 167. On the east side of the highway, the creek splits into two channels. The east fork generally flows along the toe of the SR 167 highway fill, through the large Panther Creek wetland complex then crosses SR 167 near SW 23rd Street where it flows west into Springbrook Creek. The Panther Creek wetland complex extends from near SW 41st Street to the I-405/SR 167 interchange. At one time, the Panther Creek wetland complex drained to the west across SR 167 through a series of culverts. Most of these have been plugged and the majority of flow has been redirected to the SW 23rd Street culvert underneath SR 167. A fish ladder was installed at this location immediately upstream, east of SR 167, to promote fish passage. The west fork of the creek flows underneath SR 167 via two culverts north of SW 41st Street. One of these culverts carries the main flow and the other provides for overflow during high flows. From SR 167, Panther Creek flows west to Springbrook Creek.

Rolling Hills Creek

Rolling Hills Creek originates on the hills above Talbot Road on the south side of I-405 and is a tributary of Springbrook Creek. It has a basin size of approximately 0.9 square miles. At S 15th Street, the creek flows from its natural ravine into a piped system that crosses under I-405 at Talbot Road, milepost 2.8. From here, flows move west through a series of pipes under several commercial parking lots to where it daylights on the north side of I-405 into an open channel between I-405 and a parking lot. From this point, the creek flows through culverts to the I-405/SR 167 interchange, and then it daylights again into the north end of the Panther Creek wetlands complex. Rolling Hills Creek flows south along SR 167, and crosses the highway at milepost 26 in a box culvert at SW 19th Street. From here, the creek is piped south along East Valley Road and then west along SW 19th Street to Springbrook Creek.

Unnamed Tributary to Rolling Hills Creek

This channel is likely the historic main channel of Rolling Hills Creek. This water feature has been classified as a wetland for this project, rather than a creek.

Thunder Hills Creek

Thunder Hills Creek also originates on the hills above I-405 just northeast of Rolling Hills Creek and is a tributary of Rolling Hills Creek. It has a basin size of approximately 0.6 square miles. Thunder Hills Creek crosses under I-405 at milepost 3.0 in a 48-inch-diameter culvert. At this point, the creek joins the flow from a historic coalmine. Drainage from these two culverts enters a concrete flume that flows southwest to Talbot Road. From here, the flows are piped and discharged to Rolling Hills Creek.

Unnamed Tributary to Thunder Hills Creek

An unnamed tributary to Thunder Hills Creek is a medium to high gradient creek ranging in width from one to two feet. The creek has year-round flows and the stream flows over an approximately 20-foot-high sandstone outcropping before joining Thunder Hills Creek on the south side of I-405.

Cedar River

The Cedar River crosses I-405 near the north end of the project at milepost 3.7. The Cedar River drains 166 square miles and provides half of the total annual flow into Lake Washington. Direct stormwater discharges into the Cedar River are exempted from flow control provisions according to the HRM.[10]

I-405 and pedestrian bridge crossing of the Cedar River

What is the water quality of these surface waterbodies?

Ecology prepares a 303(d) list that identifies waterbodies that do not meet the state water quality standards and the reasons why. According to the most recently approved 303(d) list (Ecology published in 2004), three waterbodies within the study area do not meet the state water quality standards: Green River, Springbrook Creek, and Cedar River.

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[10] *WSDOT 2006b*

In the study area, the Green River is 303(d) listed for fecal coliform bacteria, dissolved oxygen, and temperature. Springbrook Creek is also listed for not complying with standards for dissolved oxygen and fecal coliform bacteria. The Cedar River is listed for fecal coliform bacteria and temperature downstream of the study area.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT PROGRAM

The NPDES permit program was established under Section 402 of the CWA, which prohibits the unauthorized discharge of pollutants from a point source (pipe, ditch, well, etc.) to U.S. waters, including municipal, commercial, and industrial wastewater discharges and discharges from large animal feeding operations. Permittees must verify compliance with permit requirements by monitoring their effluent, maintaining records, and filing periodic reports.

Some historic pollutant sources to rivers in the study area have already been eliminated. In 1982, a NPDES permit was issued to move the outfall of King County's South Wastewater Treatment Plant from the Green River to Puget Sound. This project was completed in early 1987. Prior to moving the outfall, the treatment plant was a major source of pollution in the Green River causing increased temperature, low dissolved oxygen, and ammonia toxicity[11]. In 1992, the U.S. Environmental Protection Agency (EPA) approved a TMDL issued by Ecology. The Green River TMDL does not allow the discharge of ammonia-nitrogen into the river.

No other TMDLs have been developed for the waterbodies in the study area at this time. However, as stated in the 2004 303(d) list, Ecology anticipates preparing TMDLs for both the Cedar River and Springbrook Creek in the future.

Currently, King County is undertaking a major study called the Green-Duwamish Watershed Water Quality Assessment. As its goal, the water quality assessment will develop tools to analyze current and future water quality issues, to assist with salmon recovery planning, to guide stormwater management decisions, and to provide guidance for Ecology's TMDL program.

Thunder Hills Creek joins drainage from a historic coal mine at milepost 3.0. Field investigators noted a strong sulfur smell coming from the coal mine drainage and conducted a water quality investigation. Investigators determined that elevated dissolved water concentrations of iron and total aluminum indicate that this reach of Thunder Hills Creek may not provide fully functional habitat for fish and invertebrates.

[11] *King County 2000*

How does urbanization affect surface water?

Urbanization of natural landscapes radically alters natural drainage processes. In a forested landscape, vegetation and the upper soil layers capture the vast majority of rain and slowly release the rainwater into the ground. The prolific vegetation in forests draws some of the water out of the ground and releases it back into the air. Water that remains in the ground is pulled by gravity downhill toward streams, providing base flow to streams or recharge for groundwater. When the soils and vegetation are replaced by impervious surfaces such as roofs, driveways, sidewalks, parking lots, compacted lawns, and streets, much less water soaks into the ground. These impervious surfaces decrease the amount of water available to recharge the groundwater and contribute to stream base flows. Also, the increased impervious surface generates more stormwater, which runs off much more quickly and can result in streambank erosion, sedimentation, and downstream flooding.

What is urbanization?

Urbanization refers to a process in which an increasing proportion of an entire population lives in cities and the suburbs of cities. In regards to watersheds, urbanization is the process of converting vegetated landscapes to impervious areas.

Stormwater runoff in urban areas also carries pollutants, including: sediment from erosion; oil and grease from roads and parking lots; metals from tires, brakes, and roofs; and pesticides, herbicides, and fertilizers from lawns and landscaping. Some of these pollutants dissolve in stormwater, but most become attached to small particles suspended in the water.

Traffic on I-405 and SR 167 produces several specific types of pollutants in stormwater runoff. These include metals such as copper, zinc, and cadmium; oil and grease; sediment from tire and brake wear; and dirt washed off vehicles during storms.

If untreated, this runoff tends to reduce the habitat value of streams by physically changing the stream bed. The increased sediment in runoff affects water quality by increasing turbidity, which in turn reduces visibility, and by depositing layers of sediment in the streams, referred to as sedimentation. Turbidity can harm fish and aquatic insects. Removing the particles that cause turbidity (i.e., suspended solids) is the primary strategy of many stormwater treatment systems.

What is turbidity?

Turbidity is a cloudiness or haziness of water caused by individual particles of suspended solids. Measurement of turbidity is a key test of water quality.

Another example of water quality effects occurs when stormwater picks up nutrients, such as those from fertilizers or animal waste, as it travels across surfaces. These nutrients can

indirectly lower the amount of dissolved oxygen available to aquatic life. These particular pollutants are of lesser concern on roadway projects because traffic-related uses do not generate substantial amounts of these nutrients.

How is stormwater managed in the study area?

The baseline condition has a variety of stormwater facilities such as detention ponds, biofiltration swales, ecology embankments, wet vaults, and stormwater treatment wetlands that convey, detain, and treat stormwater along the project corridor. However, portions of the highway in the baseline condition do not have detention or water quality treatment for runoff because these facilities were not required when I-405 was originally built, and the Renton Nickel Improvement Project only retrofits a small portion of the existing highway pavement.

Over the years, detention standards used to regulate stormwater flows have changed to require more stringent protocols. The newest design protocols for detention ponds require matching the project's stormwater flow and duration characteristics to a selected predevelopment condition. For this project, the duration and magnitude of stormwater discharge into the streams and creeks would be generally equal to or less than that experienced under the baseline condition for the full range of design storm events, from 50 percent of the 2-year storm event through the 50-year recurrent storm event.

What is a 2-year or 50-year storm?

These terms are used to indicate the probability that a storm of a certain magnitude will occur in any particular year. For example, a 2-year storm is a storm that has a 50 percent chance of occurring in any single year, a 10-year storm has a 10 percent chance of occurring in any particular year, and a 50-year storm has a 2 percent chance of occurring in any particular year.

The WSDOT HRM is being used as the design standard for this project and reflects the best available science in stormwater management to ensure that WSDOT projects adequately protect the functions and values of critical environmental areas including wetlands, streams, lakes, and marine waters. The HRM criteria were developed to protect receiving waters from adverse hydrologic changes and water quality degradation. WSDOT maintains this manual to include all known, available, and reasonable methods of prevention and treatment for stormwater runoff discharges consistent with state and federal law. The following descriptions provide explanations of water treatment BMPs commonly used by WSDOT.

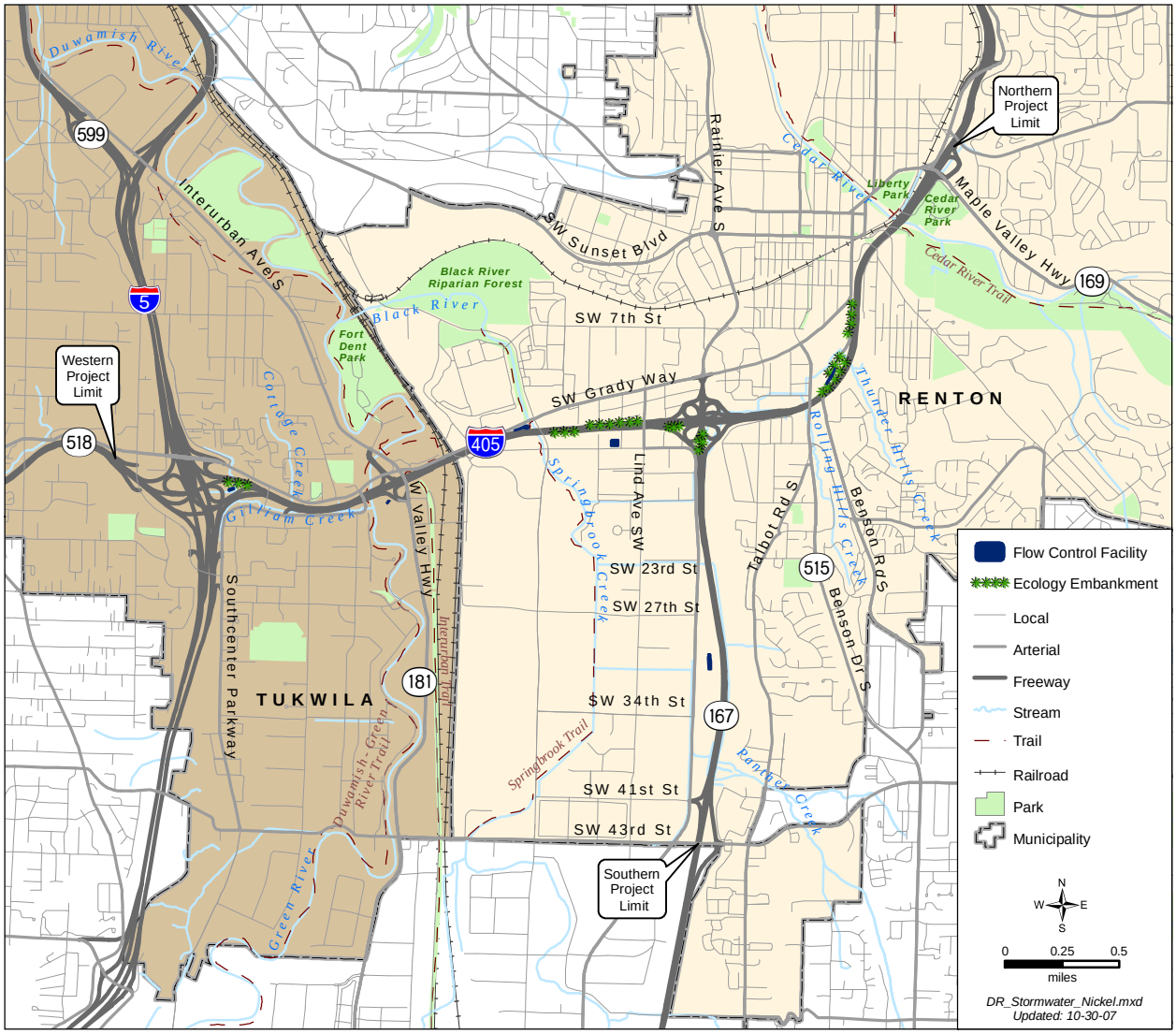
Detention Ponds

Detention ponds provide basic flow control treatment by detaining and slowing down the release of stormwater into the drainage system to assure that flooding and erosion would not increase as a result of the project. The use of wetpools within detention ponds allows some water to be held for extended periods, which provides time for suspended solids to settle out, thus allowing sediments and other pollutants to be removed from stormwater. The detention ponds for this project, however, will not include permanent wetpools because there are concerns about introducing new areas of standing water in the vicinity of the Renton Municipal Airport. Standing water can attract waterfowl and that can be a safety hazard to air traffic. The Federal Aviation Administration (FAA), United States Department of Agriculture (USDA), and Renton airport manager were consulted to coordinate air traffic safety issues associated with the design of facilities within the City of Renton limits along the I-405 corridor. For this project, the function served by wetpools will generally be replaced with ecology embankments within the wildlife hazard management zone.

Under baseline conditions, detention ponds are located in the I-405/I-5 interchange, south of I-405 at the SR 181 interchange, south of I-405 off of SW 16th Street near Oakesdale Avenue SW, west of SR 167 near the intersection of East Valley Road and SW 27th Street, and north of I-405 at Benson Road. Exhibit 4-2 shows the locations of stormwater facilities under baseline conditions within the study area. Small ponds are also located west of SR 167 near SW 23rd Street and south of SW 41st Street.

At the northern end of the project, two ponds are located at mileposts 3.6 and 3.95. These two concrete-lined ponds also serve as spill containment ponds. In the event that hazardous materials are spilled on I-405 and washed into the storm drainage system, these ponds will help to protect the City of Renton's drinking water aquifer.

Exhibit 4-2: Stormwater Facilities under Baseline Conditions in the Study Area



Biofiltration Swales

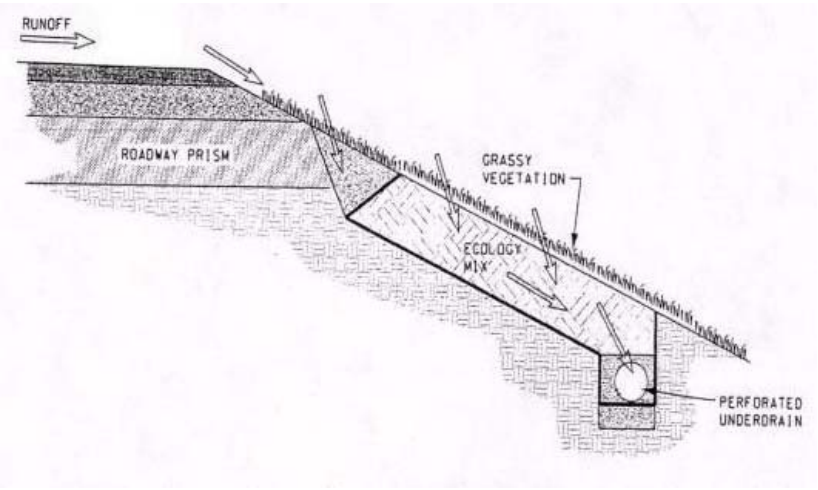
Biofiltration swales provide basic treatment and consist of broad, shallow grassy channels that are typically 200 feet long and designed so that stormwater filters through them. The vegetation and soil matrix filters and absorbs pollutants from stormwater runoff providing water quality treatment. Treatment efficiency is relatively low; biofiltration swales are designed to remove 80 percent of the total suspended solids, but typically remove around 20 to 40 percent of other pollutants from stormwater. The I-405 Team identified biofiltration swales in the baseline condition south of I-405 at mileposts 1.0 and 1.5 and north of I-405 at milepost 1.0. The

loop ramps at the SR 167 interchange on the north side of I-405 also have biofiltration swales.

Ecology Embankments

Ecology embankments provide enhanced treatment and are constructed as a continuous system placed along the highway shoulder that is filled with a granular material designed to remove pollutants. Stormwater flows off the highway and into the ecology embankment where it percolates through the media and pollutants are filtered out. The treated water is then collected by pipes and discharged off site.

Ecology embankments are very efficient at improving water quality and remove around 90 percent of most pollutants.[12] These BMPs are typically used as the first step management system that then conveys stormwater to detention ponds for flow control. Ecology embankments are generally constructed as shown in the drawing below.



In the baseline condition, ecology embankments exist in the study area along the south side of I-405 at the SR 181 interchange, on I-405 west of Springbrook Creek, on the north side of I-405 at Lind Avenue SW, on the east and west side of SR 167, and on the west side of I-405 at Benson Road.

Stormwater Cross Culverts

In the baseline condition, cross culverts convey some stormwater from one side of the highway to the other to prevent ponding along the edge of the roadway. The I-405

[12] *WSDOT 2004*

Team conducted hydrologic and hydraulic analyses of the cross culverts to ensure the proposed modifications will have no effect on the base flood elevations or backwater conditions.

How do environmental regulations affect the stormwater system design for this project?

Water quality regulations mandated by the federal CWA prohibit the discharge of pollutants from non-permitted sources. In Washington, authority for implementing the CWA is delegated to Ecology and the Corps.

The listing of salmonids under the Endangered Species Act (ESA) has triggered new requirements to protect salmon habitat and water quality. WSDOT will need to obtain a variety of permits to construct the project. The best way to apply for several of these permits is by using the JARPA. A JARPA allows an applicant to prepare a single application to apply for multiple water resource related permits issued by various agencies.

What permits does the JARPA cover?

The JARPA application covers several permits including:

- the Hydraulic Project Approval (HPA) from Washington State Department of Fish and Wildlife
- the 401 Water Quality Certification from Ecology
- the Aquatic Resources Use Authorization Notification from the Washington State Department of Natural Resources
- the Section 404 and Section 10 from the Corps
- the Bridge Act Permit and Private Aids to Navigation (PATON – for non-bridge projects) from the U.S. Coast Guard.

The Tukwila to Renton Project may not require all of these permits.

The HPA will contain a list of measures that the project will need to meet for any work within the high water mark of waters of the state. The measures focus on protecting streams from construction-related impacts and pollutants. The HPA will include seasonal limits on construction activities, based on fish use, in which any work within a stream must be completed.

The 401 certification, included in the JARPA, will verify that this project complies with state water quality standards and other aquatic resource protections.

WSDOT uses its HRM to design stormwater facilities for transportation. According to Ecology, projects meeting the Ecology guidelines or equivalent standards such as the HRM are presumed to meet federal and state water quality requirements. To meet water quality standards, the manual requires treating stormwater runoff from new pollution-generating impervious surfaces (e.g., roads) before discharge. Stormwater runoff must also receive flow control (detention) in most situations to protect the receiving water from increases in flooding and streambank erosion.

Also included in the JARPA are the permits to comply with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. These permits regulate dredging,

excavation, filling, and construction of structures within waters of the United States.

FAA regulations require airports to evaluate wildlife hazards. The introduction of facilities that could increase the area of open water within 10,000 feet of the airport are managed by these regulations. For this project, the stormwater plan was reviewed by both the City of Renton and the FAA because of the possibility of introducing facilities that could have open water and encourage wildlife. Where flow control ponds are introduced, the FAA guidelines include measures such as pond grading, planting, liners, netting, and other techniques to discourage wildlife use. Where new pond facilities are proposed within the 10,000 foot wildlife hazard management zone, the FAA, City, and USDA (who oversees wildlife hazard management considerations for the FAA) will be involved as the design continues.

For the Green-Duwamish Alluvial Aquifer, standard WSDOT construction BMPs will be used to protect its water quality. The Washington State Wellhead Protection requirements and the City of Renton Aquifer Protection regulations require spill containment ponds and other mitigation measures to protect the Cedar Valley Aquifer from potential spills on I-405. The portion of the project extending over the Cedar Valley Aquifer will meet these regulations.

What regulated floodplains are associated with the surface waterbodies in the study area?

The FIRM maps for the study area show floodplains associated with the Green River, Springbrook Creek, Panther Creek, Rolling Hills Creek, and the Cedar River. Exhibit 4-3 shows these floodplains.

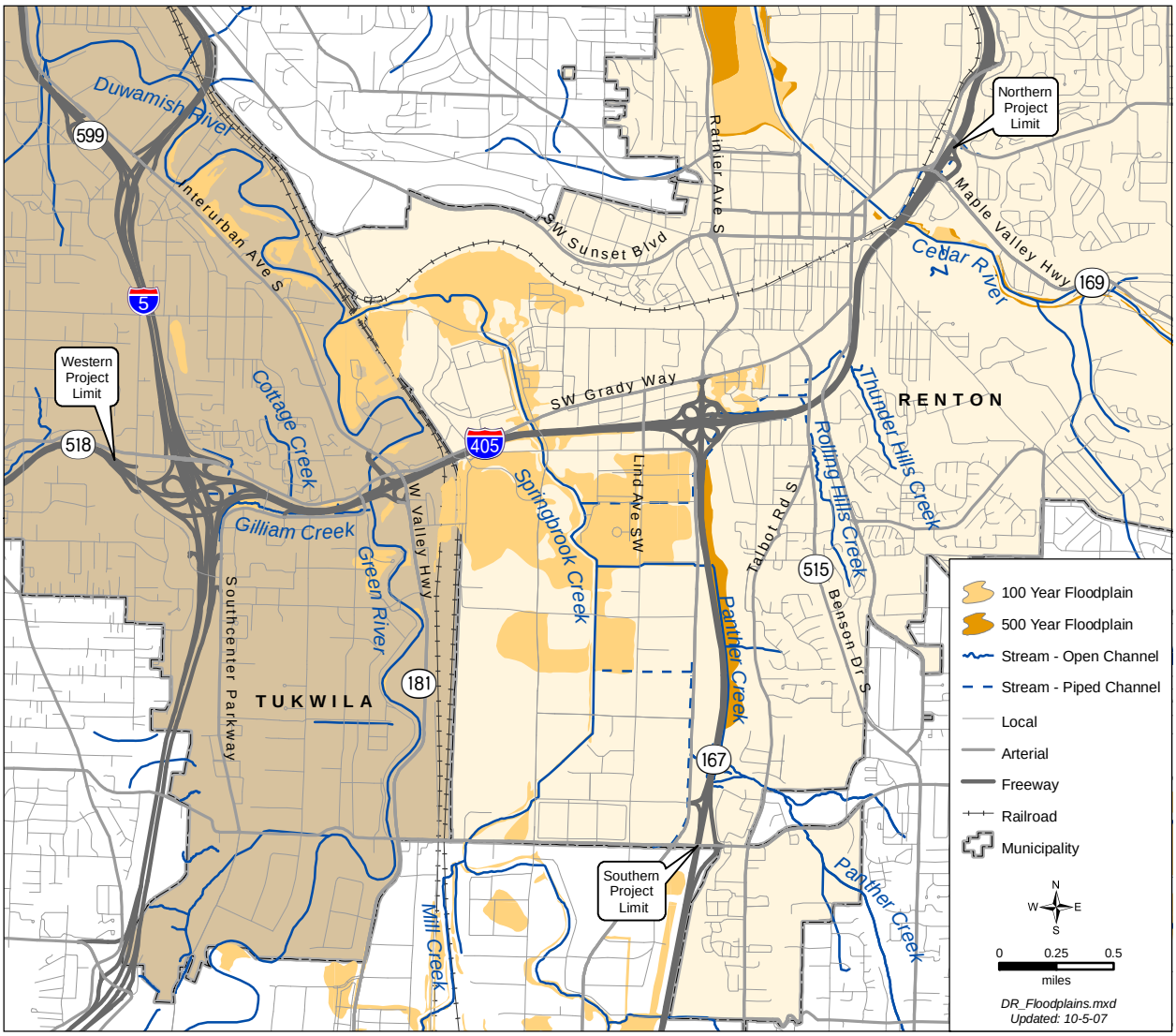
Many efforts have been made over the years to control flooding in the Green River Valley, especially as development has increased. A levee system was constructed on the Green River in the late 1800s. Although the levee reduced the frequency of floods, it also eliminated the natural floodwater storage that floodplains typically provide. In late 1961, the Corps completed the Howard Hanson Dam, near the headwaters of the Green River in King County, to further

What is a Floodplain?

A floodplain is the area bordering river channels that becomes inundated during flood level flows. These portions of river valleys are frequently defined in terms of the likelihood of flooding in a given year. Hence, the "100-year" flood event is the flood having a 1 percent chance of occurring during any given year. This flood is considered the base flood. FIRM maps identify the 100-year floodplain and are used to determine the risk of flooding for a given area.

control flooding. This dam was designed to limit peak flows to about 12,000 cfs, which is about a 25-year storm event.

Exhibit 4-3: FEMA 100-year and 500-year Floodplains in the Study Area



Springbrook Creek drains into the Black River and then to the Green River; however, its flow is controlled by the Black River pump station located north of the project. Operation of the pump station is determined by interlocal agreements and basin planning programs. The pump station can pump as much as 1,700 cfs during high flow events. This pumping rate exceeds the estimated peak flows on Springbrook Creek during a 100-year flood event, which is 1,307 cfs for current land use conditions. However, during flooding, flows on the Green River rise, reducing its capacity to receive additional flows. This decrease in capacity during floods requires that

the pumping rates from Springbrook Creek be reduced. The pump station starts reducing pumping rates when the Green River reaches flows of 9,500 cfs. If flows in the Green River exceed 12,000 cfs, then the pump station may stop operating completely until flows in the Green River go down.

Flooding along Springbrook Creek affects its tributaries. This is because with flooding in Springbrook Creek, flows from the tributaries enter and mix into floodwaters and water backs up into the tributaries. When this happens, businesses east of Springbrook Creek near the I-405/SR 167 interchange experience parking lot flooding. In addition, flooding affects Panther Creek, which ponds on both sides of SR 167.

Another tributary to Springbrook Creek is Rolling Hills Creek. This creek has a FEMA-mapped floodplain on the north side of I-405 east of SR 167. In this area, flooding is caused by undersized pipes, not because the area is in a natural floodplain. When flooding occurs, it is limited to a large parking lot.

Historic efforts to control flooding in the Cedar River included building Masonry Dam and a levee system along the river. However, flooding still occurs. When the river flow reaches 4,200 cfs, the Renton Airport experiences flooding and SR 169 may overtop and close. No flooding occurs on I-405.

What groundwater resources exist in the study area?

Most of the groundwater resources in the study area exist within sediment deposits along the Cedar River and Green River valleys. The extent of shallow aquifers closely correlates with the extent of shallow groundwater.

Shallow groundwater aquifers in the study area occur mainly in alluvial sediments. Alluvial sediments in the study area consist primarily of sand, silt, and gravel. Renton Formation bedrock underlies the alluvial sediments and its depth varies considerably throughout the study area. Groundwater, from the Renton Formation bedrock, accumulates in the abandoned Renton Coal Mine tunnel. The groundwater discharges to a wetland and stream below Benson Road.

Green-Duwamish Alluvial Aquifer

What is an unconfined aquifer?

An unconfined aquifer is usually a relatively shallow aquifer that can be recharged directly by downward seepage. An unconfined aquifer is called this because the aquifer is not overlain by a thick, low permeability layer, such as a thick deposit of clay.

The Green-Duwamish Alluvial Aquifer is an unconfined aquifer system consisting of interbedded loose to dense silty sand with organics and scattered gravel layers, soft peat, organic silt, soft to stiff silt, and clay.[13] Thickness of these sediments varies but can be over 100 feet.

Groundwater is shallow in this aquifer, often at less than 10 feet below ground surface, but varies considerably with surface topography and season. In many places, the water table is at or near land surface and is hydrologically connected to wetlands. The permeability of this aquifer is variable. Locally, where silt or clay-rich layers have accumulated, the aquifer has a low permeability and may not yield much groundwater. No groundwater supply wells are receiving water from this aquifer within 0.5 miles of the study area.[14]

What is permeability?

Permeability is a measure of a soil or rock's ability to transmit water. Soils such as clean sands and gravel have a high permeability. Excavations below the groundwater table in these types of materials will encounter heavy seepage flows requiring high capacity pumps to dewater. At the other extreme, soils such as clay and silty, very dense tills have a low permeability. Excavations below the groundwater table in these types of materials will encounter little, if any seepage.

Groundwater flow in the Green-Duwamish Alluvial Aquifer is complex. The presence of wetlands and drainage ditches locally influences groundwater flow patterns. The primary discharge is to the Green River, but some groundwater may also discharge to the Delta Aquifer subunit of the Cedar Valley Aquifer (see description below) and Lake Washington. Direct infiltration from precipitation recharges this aquifer, but recharge can also occur from higher elevation areas within the Green River drainage, and from overland flow from the bordering valley hills.

Cedar Valley Aquifer and its Subunit, the Delta Aquifer

The most important aquifer in the study area exists along the Cedar River, known as the Cedar Valley Aquifer. Exhibit 4-4 shows the boundaries of the Cedar Valley Aquifer. The Cedar Valley Aquifer is an EPA-designated "Sole-source Aquifer."

What are sole-source aquifers?

Sole Source Aquifers are EPA-designated aquifers where few or no reasonable alternatives exist for acquiring drinking water.

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[13] *GeoEngineers 2005.*

[14] *King County 2005.*

This aquifer has been subdivided into several smaller aquifer units. The Delta Aquifer subunit is located along the lower drainage of the Cedar River and is the closest to the Tukwila to Renton Project. The Delta Aquifer subunit is unconfined and composed of alluvial sediments deposited by the lower Cedar River. Other subunits of this system include the Cedar Valley Alluvial Aquifer, the Marblewood Production Aquifer, and other aquifers further up the valley (i.e., the "Deep Aquifer"). These other subunits are located outside the study area and are not discussed in this report.

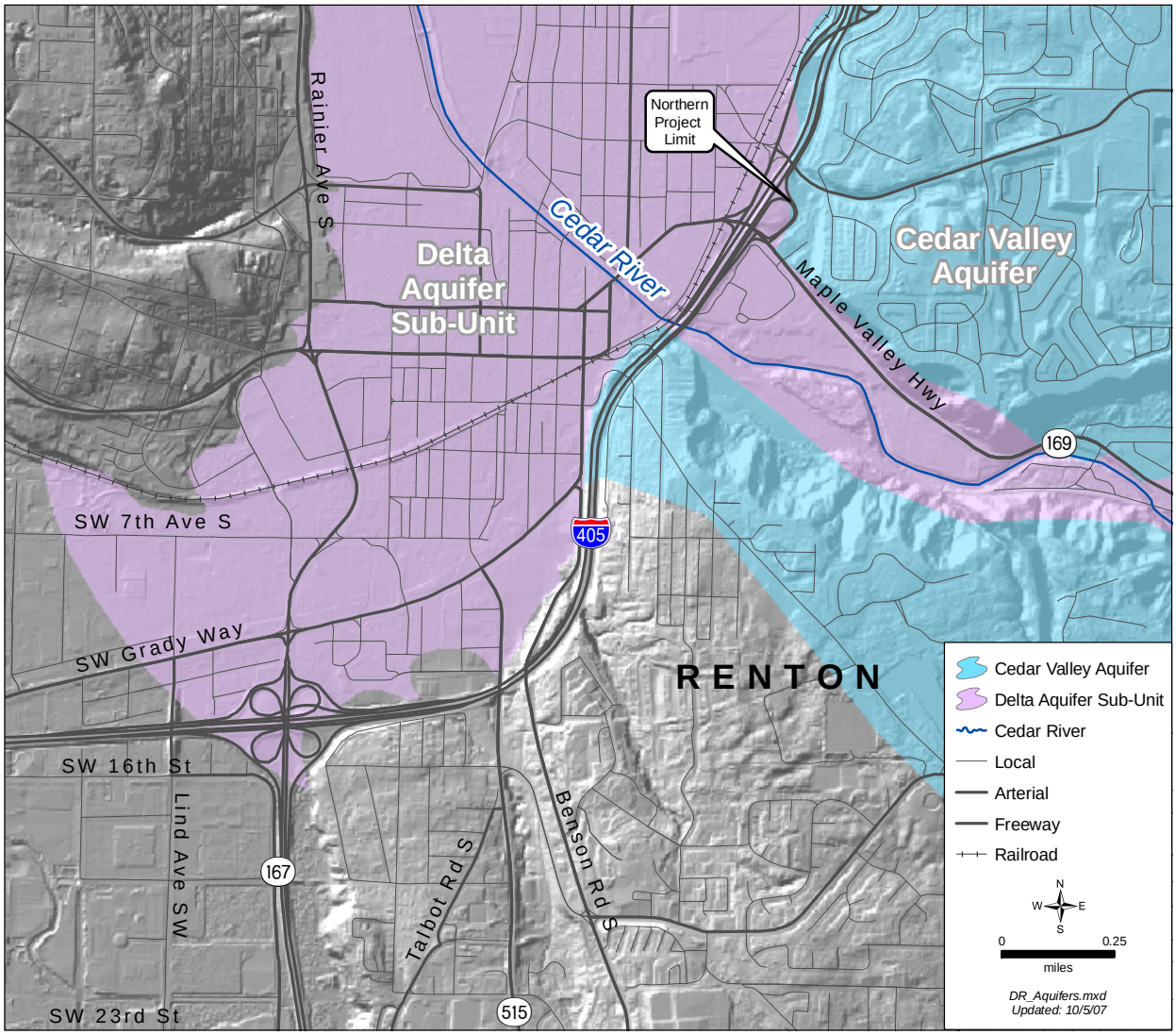
The Delta Aquifer subunit occurs within the Cedar River Valley between bedrock exposures to the south of the Cedar River and glacial uplands along the north side of the valley. Its western boundary is Lake Washington, and the eastern boundary continues southeast up the Cedar River, outside the study area. The depth to the water table varies, but it is generally shallow (less than 25 feet) in the vicinity of the study area. The Delta Aquifer subunit has a saturated thickness of between 65 and 90 feet.[15] The Delta Aquifer subunit is recharged by infiltration from the flow of surface water and groundwater originating in the bordering hills within its drainage basin and groundwater flow from underlying bedrock. The Delta Aquifer subunit discharges to groundwater supply wells, to the Cedar River, and to Lake Washington.

What do you mean by saturated?

Saturated means that all pores or open spaces in a geologic material are completely filled with groundwater at or greater than atmospheric pressure. Saturated thickness is an indication of the amount of water that may be available. The greater the saturated thickness for a geologic material, the greater the potential amount of groundwater that may be available.

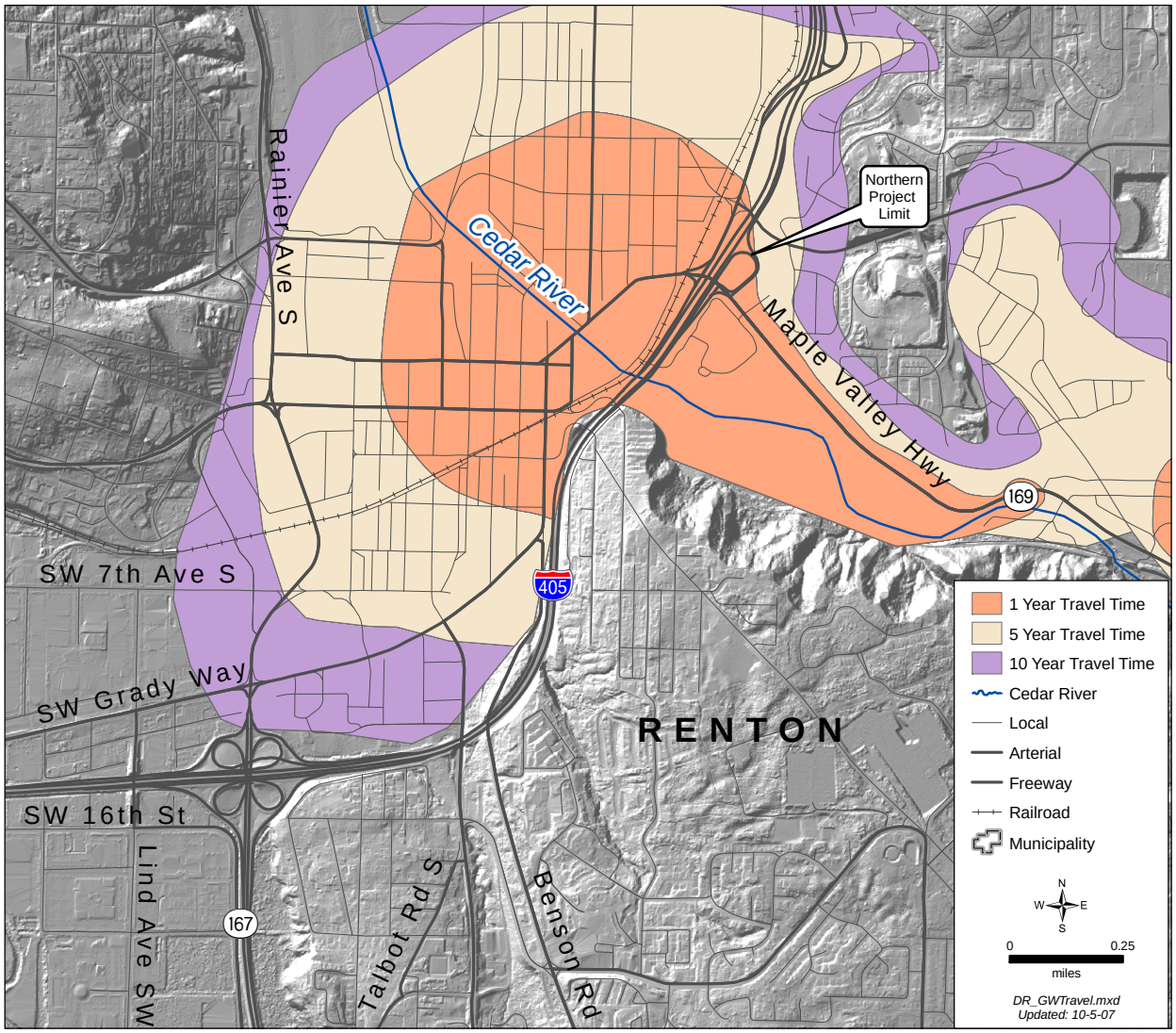
[15] *RH2 and Pacific Groundwater Group 1993.*

Exhibit 4-4: Boundaries of the Cedar Valley Aquifer and its Subunit, the Delta Aquifer, in the Vicinity of the Study Area



Groundwater flow in the Delta Aquifer subunit is predominantly along the valley from east to west. The City of Renton production wells are situated to capture most of the groundwater flowing through the aquifer. Exhibit 4-5 shows modeled groundwater capture zones in the Delta Aquifer subunit for 1-year, 5-year, and 10-year travel times.

Exhibit 4-5: 1-year, 5-year, and 10-year Groundwater Travel Times for the City of Renton's Well Field in the Delta Aquifer Subunit



How is groundwater used in the study area?

Groundwater within the study area has multiple uses, such as groundwater rights and groundwater wells. Specific uses are discussed below.

Groundwater Rights

Groundwater is extracted and used for water supply along the study area. Groundwater certificates and permits for uses that have a point of withdrawal within 0.5 miles of the Tukwila to Renton Project are listed in Appendix A.[16] Appendix A does

[16] *Ecology 2005.*

not list surface water rights, but it does include water certificates and permits for springs, since springs represent groundwater discharges.

Groundwater Wells

What are Group A and B wells?

Group A wells serve 15 or greater households. Group B groundwater supply wells serve between 2 and 14 households.

Many documented water supply wells exist within 0.5 miles of the study area. Existing groundwater wells in the study area include Group A, Group B, and other types of groundwater wells.[17]

The locations of all Group A groundwater supply wells within the study area is illustrated on Exhibit 4-6. The one Group B-designated well in the study area is located outside the 0.5-mile radius of the study area and will not be affected by the proposed project. All Group A wells in the study area are owned and operated by the City of Renton. These six Group A wells are within 0.5 miles of the I-405 corridor and extract groundwater from the Delta Aquifer subunit (Exhibit 4-6). The Delta Aquifer subunit is the primary aquifer that the City of Renton uses for municipal purposes.

Exhibit 4-6: Group A Wells in the Study Area

The Green-Duwamish Alluvial Aquifer within the study area is not used for water supply by water purveyors for Group A or Group B wells systems. There are "other" wells besides A and B wells that consist primarily of decommissioned wells, environmental monitoring wells not used for potable supply, and dewatering wells used on a temporary basis during construction.[18] According to a search of Ecology's database, none of the "other" wells within the project right-of-way are used for domestic water supply or irrigation purposes.

What is the quality of these groundwaters?

The Delta Aquifer subunit of the designated sole-source, Cedar Valley Aquifer produces good quality water for potable use. The groundwater meets all Washington State Department of Health water quality criteria.

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[17] *King County 2005.*

[18] *Ecology 2005.*

How is groundwater quality protected?

One of the primary purposes of this report is to identify areas that are particularly susceptible to groundwater contamination. These areas are identified because they currently supply or can supply water for drinking and industrial uses, and they are hydrologically connected to bodies of surface water, such as lakes or rivers. Specific areas and their conditions are discussed below.

Critical Aquifer Recharge Areas

Critical Aquifer Recharge Areas (CARA) are one element of the critical areas for which Washington's Growth Management Act (GMA) requires local governments to develop policies or regulations to protect their functions and values. CARA are the geographic areas that have a critical recharging effect on aquifers used for potable water.[19]

The only aquifer used for potable water in the study area is the Cedar Valley Aquifer. Most of the recharge for the Cedar Valley Aquifer occurs in areas upriver from the study area. None of these recharge areas are classified as CARAs.

Green-Duwamish Alluvial Aquifer

The Green-Duwamish Alluvial Aquifer near the study area is not used for domestic water supply or irrigation purposes. Therefore there is no special sole-source designation for this aquifer. This aquifer would fall under the protection of State groundwater regulations that are applicable to all groundwater.

Cedar Valley Aquifer

The City of Renton petitioned the EPA to designate the aquifer along the Cedar River as a sole-source aquifer in March 1988.[20] The petition was submitted because the City's water supply to the public is dependent on this aquifer. The Cedar Valley Aquifer was designated a sole-source aquifer on October 17, 1988 by the EPA, supporting the goals of aquifer protection

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[19] *King County 2004*

[20] *CH2M Hill 1988b*

previously initiated by the City.[21] The EPA states the reasons for designation as follows:

- The Cedar Valley Aquifer supplies at least 80 percent of the drinking water used in the aquifer service area.
- No economically feasible alternative drinking water sources exist.
- Contamination of the aquifer would pose a substantial hazard to public health.

The Cedar Valley Aquifer boundary within the study area is shown in Exhibit 4-4 (source: City of Renton 2003 and EPA 1988). As discussed previously, the Delta Aquifer subunit is most susceptible to potential effects from the Tukwila to Renton Project.

The City has numerous groundwater monitoring wells surrounding its production wells for aquifer testing and water quality monitoring. All production wells are located within the designated sole-source aquifer.

Capture Zones and Travel Times

The City of Renton conducted a study of groundwater travel times being captured by its production wells to formulate wellhead protection areas for its wells. The results are presented in Exhibit 4-5 for 1-year, 5-year, and 10-year groundwater capture zones. Groundwater capture travel times are used for aquifer protection planning.

What are wellhead protection areas?

Wellhead Protection Areas (WHPA) are the areas surrounding a drinking water well that supply groundwater to the well. The boundary of the WHPA is determined by the distance a contaminant travels in a designated time period. For instance, a 5-year WHPA is the distance from a well where a contaminant released into the groundwater would take 5 years to reach the well.

Aquifer Protection Ordinances

The City of Renton established Aquifer Protection Zones for the Sole-Source Cedar Valley Aquifer and its production well fields. Exhibit 4-7 presents the boundaries for Cedar Valley Aquifer Protection Zones 1 and 2. Renton enacted local ordinances specifically to protect its sole-source aquifer and production well fields within the boundaries of Zones 1 and 2. The ordinances are specific to the aquifer protection zones and are in the Renton Municipal Code.[22] The code specifies construction requirements for stormwater facilities and pipelines, sewer pipelines, storage limitations for

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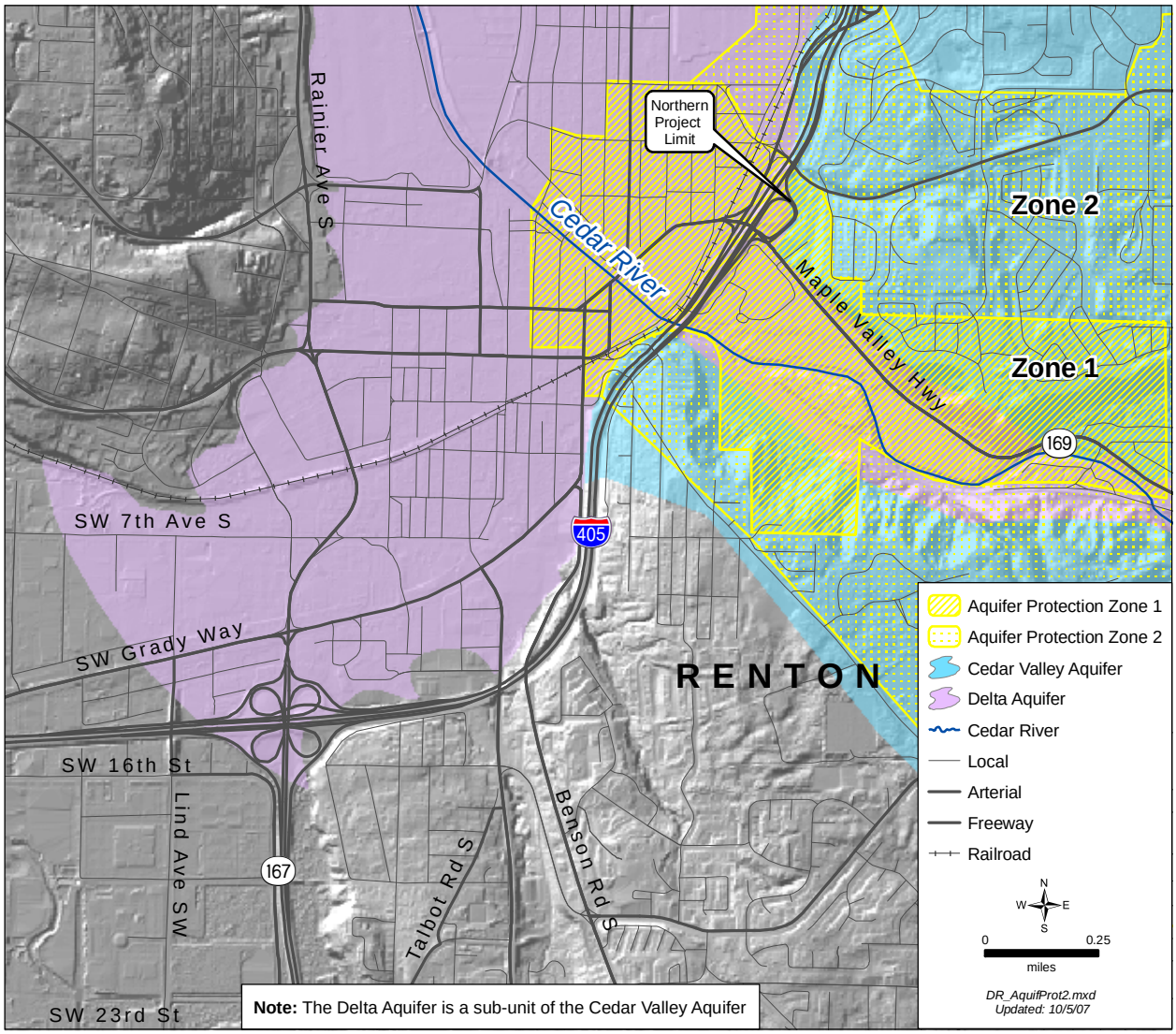
[21] *U.S. Environmental Protection Agency 1988*

[22] *Renton, City of, 2005, Renton Municipal Codes (RMC) http://www.ci.renton.wa.us/.*

hazardous/toxic substances, and other requirements for activities within the aquifer protection zones.

Exhibit 4-7: Cedar Valley Aquifer Groundwater Protection Zones 1 and 2



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